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TABLE OF CONTENTS

	PAGE
1. The Stratigraphy of the Devonian Holland Quarry Shale of Ohio. By J. Ernest Carman.....	1
2. A New Specimen of <i>Desmatochelys lowi</i> Williston. A Primitive Cheloniid Sea Turtle from the Cretaceous of South Dakota. By Rainer Zangerl and Robert E. Sloan.....	7
3. <i>Arctoryctes</i> and Some Other Chadronian Vertebrate Microfossils from Nebraska. By William D. Turnbull and Charles A. Reed.....	41
4. The Triassic Reptile, <i>Poposaurus</i> . By Edwin H. Colbert.....	59
5. Eurypterids of the Devonian Holland Quarry Shale of Ohio. By Erick N. Kjellesvig-Waering.....	79
6. A Reconstruction of the Shield of the Arthrodire, <i>Bryantolepis brachycephalus</i> (Bryant). By Robert H. Denison.....	99
7. New Silurian Heterostraci from Southeastern Yukon. By Robert H. Denison.....	105
8. <i>Parasaurolophus cyrtocristatus</i> , a Crested Hadrosaurian Dinosaur from New Mexico. By John H. Ostrom.....	143
9. A Revision of the Families and Genera of the Stylonuraceae (Eurypterida). By Erik N. Kjellesvig-Waering.....	169
10. Relationship of <i>Diadectes</i> . By Everett Claire Olson.....	199

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THE STRATIGRAPHY OF THE DEVONIAN HOLLAND QUARRY SHALE OF OHIO

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A large stone quarry in Monclova Township (south $\frac{1}{2}$, sec. 29), Lucas County, Ohio, was operated for many years by the France Stone Company. It is two miles north of the small village of Monclova, three miles south-southwest of the town of Holland, and about ten miles west-southwest of the city of Toledo. It is commonly known as the Holland Quarry. The quarry has been abandoned and is partly filled with water.

The column of rock units existing in the region is given below, but only the units directly above and directly below the Silurian-Devonian systemic contact are involved in the discussion.

<i>System</i>	<i>Series</i>	<i>Group</i>	<i>Formation</i>
Devonian	Ulsterian (Middle Devonian)	Detroit River	Anderdon dolomite
			Lucas dolomite
			Amherstburg dolomite
			Sylvania sandstone (disconformity)
Silurian	Cayugan (Upper Silurian)	Bass Islands	Raisin River dolomite
			Put-in-Bay dolomite
			Tymochtee shaly dolomite
			Greenfield dolomite

The Holland Quarry is located on the Lucas County monocline, a north-south structure with the strata dipping westward 6 to 8 degrees. At the top of the west wall of the quarry is the rock crusher plant. Below the plant and for 50 or 75 yards to the north and the south, the bedrock of the upper 15 or 20 feet of the quarry wall has been completely buried by dump material from the plant. Just east of the rock crusher and 15 or 20 feet below the top of the quarry wall was an outcrop of poorly bedded, brownish-black, compact shale

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at the same level as the Raisin River dolomite which outcrops only 30 or 40 feet to the north and also to the south (see fig. 1). An area about 5 by 10 feet was cleared on the shale outcrop, and the shale was exposed at several other places, some of them at the contact with the adjoining dolomite, in order to determine the approximate extent of the shale mass on the quarry slope. No bedrock was seen on the upper 15 feet of the quarry slope above the shale exposure. However, about 100 yards to the north and a similar distance to the south of the crusher, the quarry wall is capped by Sylvania sandstone from 2 to 4 feet in depth, resting disconformably on the Raisin River dolomite.

From the shale I obtained a large collection of fossils, including ostracoderms, early fishes, eurypterids, and some plant remains. This paper presents the stratigraphic relations of the shale mass to the surrounding rock units and discusses their bearing on the geologic age of the shale and the fossils it contains. The fishes are being studied by Robert H. Denison, Curator of Fossil Fishes, and the eurypterids by Erik N. Kjellesvig-Waering, Research Associate, both of Chicago Natural History Museum.

Between 15 and 25 feet below the top of the quarry face, the width of the shale mass is about 50 feet (fig. 1). The lateral contacts of the shale with the dolomite are sharp, and they slope toward the shale mass at angles varying from 45 to 60 degrees. The base of the shale mass was concealed, but the converging, lateral contacts with the dolomite indicate a broad, rounded base a short distance below the bottom of the exposure.

Near the contact, the laminae or bedding planes of the shale dip away from the dolomite at an angle of a few degrees, becoming horizontal at a distance of a few feet. Near the contact the shale encloses pieces of the dolomite up to several inches across. Scattered through the shale are a few grains of well-rounded, polished quartz sand, identical with the sand of the Sylvania sandstone.

One must conclude that the shale occupies a depression in the Raisin River dolomite eroded after its lithification. From the exposure on the quarry slope the depression might be a roughly circular pit about 60 feet across and from 20 to 30 feet deep, or the exposure might be the cross section of a filled valley with width and depth as noted above. In this latter case the elongate shale mass would dip westward along with the enclosing rock units. Since the Raisin River dolomite is the highest formation of the Silurian system we must place the time of the deposition of the shale as post-Silurian.

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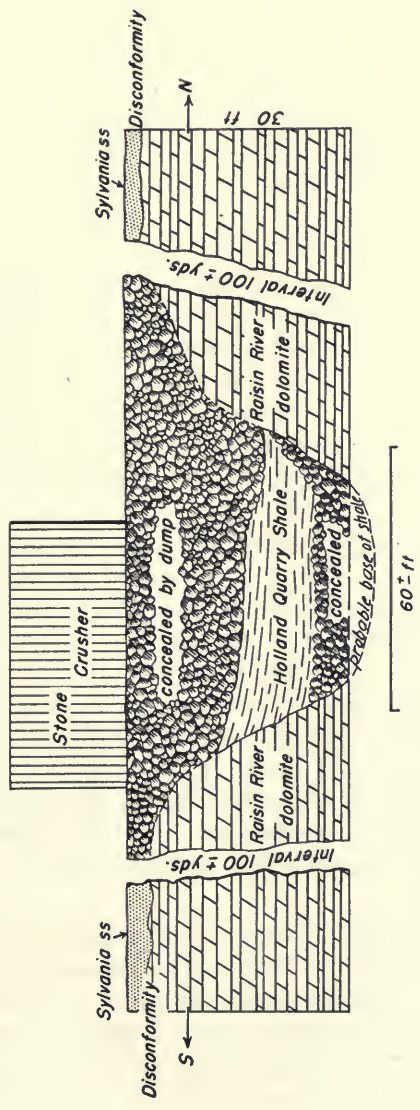


FIG. 1. Sketch of the west wall of the Holland quarry directly east of the stone-crusher plant, showing the outcrop of the Holland Quarry shale and its stratigraphic relations to the Raisin River dolomite and the Sylvania sandstone.

Next above the Raisin River dolomite and the Silurian-Devonian disconformity is the Sylvania sandstone. It rests disconformably on the Raisin River at exposures along the quarry wall about 100 yards south and 100 yards north of the shale exposure, and this same disconformable relation exists at every known exposure of this contact in northwestern Ohio. Although no exposure showed the Sylvania sandstone resting directly on the black shale, the general relations are such that I am convinced that the sandstone does disconformably overlie the shale.

The Sylvania is a white, friable, medium- to fine-grained sandstone. The grains are pure quartz, of uniform size, well rounded and pitted, with all the characteristics of wind-blown sand. In northwestern Ohio the Sylvania sandstone is from 25 to 40 feet thick and grades upward through a transition zone into the dolomite of the Detroit River group (Carman, 1936, pp. 258-260). In the transition zone the fauna of the overlying Detroit River dolomite is present, and in several places the same fossils are present lower down in the pure Sylvania sandstone. These Detroit River fossils indicate a mid-Devonian age.

These facts may be interpreted as follows: During Early Devonian time an erosion surface was developed on the Bass Island dolomite. In early Middle Devonian time wind-blown sand drifted into northern Lucas County from the north or northwest and accumulated over the surface to a thickness ranging from 10 to 25 feet, becoming thinner southward. This was the thinning edge of the far greater thickness of sand deposited in central Michigan. Then came the advance from the north of the mid-Devonian Detroit River sea. As this sea advanced southward, it reworked the thin veneer of loose eolian sand, redeposited it under marine conditions, and incorporated the remains of the mid-Devonian life that lived in this encroaching sea.

In summary, the Silurian-Devonian disconformity between the Raisin River dolomite and the Sylvania sandstone represents all of Early Devonian (Helderberg-Deerpark) time and the early part of the Middle Devonian (Onesquethaw). During this interval a trench or pit was eroded in the Raisin River dolomite and later filled with black mud sediments in which were incorporated remains of organisms living there at that time and a few grains of quartz sand probably brought to this locality from the north partly by eolian action. Later in mid-Devonian times a remnant of this black shale, protected by its position in the trench or pit in the

Raisin River dolomite, was covered by the Sylvania sandstone and a great thickness of middle Paleozoic rocks. Regional erosion during the present cycle and finally the quarry excavation exposed the shale mass. This black shale may have been deposited any time during the Lower Devonian or early part of the Middle Devonian.

Normally a rock unit so small as this shale mass appears to be might not deserve a geologic name, but in consideration of its interesting and unusual fossils it probably should be given a name. The name *Holland Quarry shale* is here proposed.

REFERENCE

CARMAN, J. ERNEST

1936. Sylvania sandstone of northwestern Ohio. Bull. Geol. Soc. Amer., 47, pp. 253-266, figs. 1-5, pl. 1.



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